WHAT IS CLAIMED IS:

1. An optical fiber Bragg grating thermal compensating device, comprising:

a substrate, formed with an indent having a first length thereon and having a first thermal expansion coefficient;

means for compressing optical fibers; and

an optical fiber embedded with grids, the grids being affixed to the compressing means.

2. The device according to Claim 1, wherein the compressing means includes a first metal block having a second thermal expansion coefficient that is much greater than the first thermal expansion coefficient, and a second length smaller than the first length, the first metal block being affixed to an end of the indent of the substrate such that a space is formed between the substrate and the metal block; and

wherein the optical fiber have a first end affixed to the first metal block and a second end affixed to a affixing member of the substrate, the affixing member being located in the indent of the substrate and distant from the first metal block.

3. The device according to Claim 1, wherein the compressing means includes:

a first metal block having a second thermal expansion coefficient that is much greater than the first thermal expansion coefficient, and a second length smaller than the first length, the first metal block being affixed to an end of the indent of the substrate such that a space is formed between the substrate and the metal block;

a compensating block, made of a pliable material of a lower rigidity than that of the metal block and the substrate, and having a fourth length adapted to be affixed within the space; and

wherein the grids have an overall length being slightly smaller than the

fourth length, and are adhered to the compensating block along their surface such that the grids are located next to the compensating block.

4. The device according to Claim 1, wherein the compressing means includes a thin film having a second thermal expansion coefficient that is much greater than the first thermal expansion coefficient, and a fifth length smaller than the first length, the thin film being integrally surrounding and firmly coating on the optical fiber located within the indent of the substrate such that the thin film is allowed to expand within the indent along a longitudinal direction of the optical fiber; and

   wherein the optical fiber has two ends respectively affixed to the substrate at a first affixing point and at a second affixing point along the longitudinal direction of the optical fiber, so that the fiber grids and the thin film are located between the first and the second affixing points and located within the indent of the substrate.

5. The device according to Claim 5, wherein the thin film of the compressing means is made of metal, such as aluminum or copper, integrally coated on the optical fiber.

6. The device according to Claim 6, wherein the thin film of the compressing means is made of mixture of metallic powder and epoxy resin integrally formed on the optical fiber.

7. The device according to Claim 1, wherein the compressing means includes a floating metal block having a second thermal expansion coefficient that is much greater than the first thermal expansion coefficient, and a sixth length smaller than the first length, the floating metal block being affixed to the optical fiber along a longitudinal direction of the optical fiber located within the indent of the substrate such that the floating metal block is allowed to expand within the indent along the longitudinal direction of the optical fiber; and

   wherein the optical fiber has two ends respectively affixed to the substrate at a first affixing point and at a second affixing point along the longitudinal direction of the optical fiber, so that the fiber grids and the floating metal block are located between the first and the second affixing

points and located within the indent of the substrate.8. The device according to Claim 7, wherein the floating metal block is adhered to the substrate by a elastically deformable adhesive that allows the floating metal block to expand along the longitudinal direction of the optical fiber within the indent.

9. The device according to Claim 1, further comprising a manually adjusting means including: a first and a second arms integrally formed at one end of the substrate and spaced apart with each other along a longitudinal direction of the substrate, and a threaded rod having a section of positive screw thread and a section of counter screw thread, in which the sections of the positive screw thread and the counter screw thread respectively engage the first and second arms, so that the first and second arms can move relatively along the longitudinal direction of the substrate, when rotating the threaded rod.

10. An optical fiber Bragg grating thermal compensating device, comprising:

a substrate, formed with an indent having a first length thereon and having a first thermal expansion coefficient;

a first metal block having a second thermal expansion coefficient that is much greater than the first thermal expansion coefficient, and a second length smaller than the first length, the first metal block being affixed to an end of the indent of the substrate such that a space is formed between the substrate and the metal block; and

an optical fiber embedded with grids, the grids having a first end affixed to the first metal block and a second end affixed to a affixing member of the substrate, the affixing member being located in the indent of the substrate and distant from the first metal block.

11. The device according to Claim 10, wherein the first metal block is in contact with part of the grids next to the first metal block.

12. The device according to Claim 10, wherein the affixing member is an integral part of the substrate.

13. The device according to Claim 10, further comprising a manually

adjusting mean including: a first and a second arms integrally formed at one end of the substrate and spaced apart with each other along a longitudinal direction of the substrate, and a threaded rod having a section of positive screw thread and a section of counter screw thread, in which the sections of the positive screw thread and the counter screw thread respectively engage the first and second arms, so that the first and second arms can move relatively along the longitudinal direction of the substrate, when rotating the threaded rod.

14. The device according to Claim 10, wherein the affixing member is a second metal block having the second thermal expansion coefficient and a third length, and wherein sum of the second and third length is smaller than the first length such that a space is remained between the two metal blocks when the first and the second metal blocks are each affixed to opposing ends of the indent.

15. The device according to Claim 14, wherein the grids have an overall length being slightly smaller than the difference between the first length and the sum of the second and third length.

16. The device according to Claim 10, wherein the optical fiber is cured to the substrate and/or the metal block by AB thermally cured adhesive at a temperature of 100°C.

17. The device according to Claim 10, where in the grids are affixed to the substrate and/or metal block by means of instant cured adhesive while the grids are under tension.

18. The device according to Claim 10, wherein the substrate is made of quartz.

19. The device according to Claim 10, wherein the metal block is made of aluminum.

20. The device according to Claim 10, wherein the metal block is made of stainless steel.

21. An optical fiber Bragg grating thermal compensating device, comprising:

a substrate, formed with an indent having a first length thereon and

having a first thermal expansion coefficient;

a first metal block having a second thermal expansion coefficient that is much greater than the first thermal expansion coefficient, and a second length smaller than the first length, the first metal block being affixed to an end of the indent of the substrate such that a space is formed between the substrate and the metal block;

a compensating block, made of a pliable material of a lower rigidity than that of the metal block and the substrate, and having a fourth length adapted to be affixed within the space; and

an optical fiber embedded with grids, the grids having an overall length being slightly smaller than the fourth length, and being adhered to the compensating block along their surfaces such that the grids are located next to the compensating block.

22. The device according to Claim 21, wherein the substrate is made of quartz.

23. The device according to Claim 21, wherein the metal block is made of aluminum.

24. The device according to Claim 21, wherein the metal block is made of stainless steel.

25. The device according to Claim 21, further comprising a manually adjusting means including: a first and a second arms integrally formed at one end of the substrate and spaced apart with each other along a longitudinal direction of the substrate, and a threaded rod having a section of positive screw thread and a section of counter screw thread, in which the sections of the positive screw thread and the counter screw thread respectively engage the first and second arms, so that the first and second arms can move relatively along the longitudinal direction of the substrate, when rotating the threaded rod.

26. A method for manufacturing an optical fiber Bragg grating thermal compensating device, comprising the steps of:

(a) providing a substrate having a first thermal expansion coefficient,

and formed with an indent having a first length;

(b) providing a first metal block having a second thermal expansion coefficient much greater than that first thermal expansion coefficient, and a second length smaller than the first length;

(c) affixing the first metal block to an end of the indent of the substrate;

(d) providing an optical fiber embedded with grids at a mid-section thereof;

(e) affixing an end of the optical fiber to the first metal block;

(f) selecting an affixing point on the device; and

(g) affixing another end of the optical fiber to the affixing point along a longitudinal direction thereof.

27. The method according to Claim 26, wherein the affixing point is located on the substrate distant from the first metal block.

28. The method according to Claim 26, further comprising the following steps prior to step (d):

(c-1) providing a second metal block having the second thermal expansion coefficient, and a third length smaller than the difference between the first and the second length; and

(c-2) affixing the second metal block to another end of the indent of the substrate such that a space is formed between the first and the second metal blocks.

29. The method according to Claim 28, wherein the affixing point is located on the second metal block.

30. The method according to Claim 26, further comprising the step of:

(h) placing the device under a thermal state.

31. The method according to Claim 30, wherein the optical fiber is cured to

the substrate and the metal block by AB thermally cured adhesive.

32. The method according to Claim 31, further comprising the following step of:

    (i) annealing the grids by continuously placing the device under the thermal state for a pre-determined period of time.

33. The method according to Claim 26, further comprising the following step prior to step (e):

    (d-1) applying tension to the optical fiber.

34. The method according to Claim 26, wherein the substrate is made of quartz.

35. The method according to Claim 26, wherein the metal block is made of aluminum.

36. The method according to Claim 26, wherein the metal block is made of stainless steel.

37. A method for manufacturing an optical fiber Bragg grating thermal compensating device, comprising the steps of:

    (a) providing a substrate having a first thermal expansion coefficient, and formed with an indent having a first length;

    (b) providing a first metal block having a second thermal expansion coefficient much greater than that first thermal expansion coefficient, and a second length smaller than the first length;

    (c) affixing the first metal block to an end of the indent of the substrate;

    (d) providing a compensating block made of a pliable material of a lower rigidity than that of the metal block and the substrate;

    (e) affixing the compensating block within the space;

    (f) providing an optical fiber embedded with grids at a mid-section

thereof; and

(g) affixing the optical fiber to compensating block along a longitudinal surface thereof such that the grids are located next to the compensating block.

38. The method according to Claim 37, wherein the substrate is made of quartz.

39. The method according to Claim 37, wherein the metal block is made of aluminum.

40. The method according to Claim 37, wherein the metal block is made of stainless steel.

41. An optical fiber Bragg grating thermal compensating device, comprising:

a substrate, formed with an indent having a first length thereon and having a first thermal expansion coefficient;

an optical fiber embedded with grids, having two ends respectively affixed to the substrate at a first affixing point and at a second affixing point along a longitudinal direction of the optical fiber;

a thin film having a second thermal expansion coefficient that is much greater than the first thermal expansion coefficient, and a fifth length smaller than the first length, the thin film being integrally surrounding and firmly coating on the optical fiber located within the indent of the substrate such that the grids and the thin film are located between the first and the second affixing points, and the thin film is allowed to expand within the indent along the longitudinal direction of the optical fiber.

42. The device according to Claim 41, wherein the thin film is made of metal or mixture of metal powder and epoxy resin.

43. The device according to Claim 41, further comprising a manually adjusting mean including: a first and a second arms integrally formed at one end of the substrate and spaced apart with each other along a longitudinal direction of the substrate, and a threaded rod having a section of positive screw thread and a section of counter screw thread, in

which the sections of the positive screw thread and the counter screw thread respectively engage the first and second arms, so that the first and second arms can move relatively along the longitudinal direction of the substrate, when rotating the threaded rod.

44. An optical fiber Bragg grating thermal compensating device, comprising:

a substrate, formed with an indent having a first length thereon and having a first thermal expansion coefficient;

an optical fiber embedded with grids, having two ends respectively affixed to the substrate at a first affixing point and at a second affixing point along a longitudinal direction of the optical fiber;

a floating metal block having a second thermal expansion coefficient that is much greater than the first thermal expansion coefficient, and a sixth length smaller than the first length, the floating metal being integrally surrounding and firmly coating on the optical fiber located within the indent of the substrate such that the grids and the floating metal block are located between the first and the second affixing points, and the floating metal block is allowed to expand within the indent along the longitudinal direction of the optical fiber.

45. The device according to Claim 44, wherein the floating metal block is adhered to the substrate by an elastically deformable adhesive that allows the floating metal block to expand within the indent along the longitudinal direction of the optical fiber.

46. The device according to Claim 44, further comprising a manually adjusting mean including: a first and a second arms integrally formed at one end of the substrate and spaced apart with each other along a longitudinal direction of the substrate, and a threaded rod having a section of positive screw thread and a section of counter screw thread, in which the sections of the positive screw thread and the counter screw thread respectively engage the first and second arms, so that the first and second arms can move relatively along the longitudinal direction of the substrate, when rotating the threaded rod.